instruction consisted of an explanation of the instruments, weather maps and charts, with some remarks on weather forecasting, and the value of the Weather Bureau's records.

---

Mr. C. F. von Herrmann, Section Director, Raleigh, N. C., on January 16 began his second year as instructor in meteorology at the Agricultural and Mechanical College at West Raleigh. He has prepared a course of twelve lectures, to be delivered before the senior class in agriculture, comprising:

1. The atmosphere; its origin, evolution, and arrangement.
2. The physical properties of the atmosphere; sources of heat.

3 and 4. The temperature of the atmosphere.

5. The pressure of the air.
6. Moisture, and its condensation into cloud, etc.
7. The various forms of precipitation.
8. Winds.
9. General circulation of the atmosphere.
10. Cyclones and anticyclones.
11. Weather and local storms.
12. The work of the Weather Bureau.

---

Mr. Edward L. Wells, Observer, Boise, Idaho, was visited on January 18 by the class in physical geography of the Boise High School, and on January 21 by a number of pupils from one of the public schools. Instruction was given on both occasions in the use of instruments, methods of forecasting, with some reference to long-range forcasting, collecting data, and disseminating information.—*F. O. S.*

## METHODS OF MEASURING DURATION OF RAINFALL.

Mr. T. Okada[1] has applied to Japanese records the formula proposed some years ago by Prof. Dr. W. Köppen[2] for determining the absolute duration of precipitation from observations at regular intervals. Let $n$ be the total number of observations, and $r$ the number of observations with precipitation. Then $r/n$ is the absolute probability of precipitation, and if $N$ be the total number of hours in a month, then $(r/n)\ N$ is the probable duration of rainfall in hours during the month.

A comparison of the duration calculated by this method from hourly observations with the duration recorded by a very sensitive pluviograph from 1899–1903 shows a mean difference in the total annual duration of 6 per cent, with an extreme difference of 12 per cent. If monthly values are considered, the difference will average 11 per cent of the calculated amount, with an extreme difference of 25 per cent, the extremes occurring always in the colder months, when the duration is least. As a rule the calculated duration exceeds the recorded duration, although in the warmer months the reverse is not infrequently the case. This, in Mr. Okada's opinion, may be explained by the failure of the pluviograph to record the very light snows of winter, and its tendency, owing to the sluggishness of the rain gage, to exaggerate the duration of the light showers of summer. The pluviograph used is a modified form of Rung's weighing gage.[3]

In order to compare the results computed from hourly observations with those from six-daily and tridaily observavations, records were taken for the ten years ending in 1902 from the following eight stations, distributed in various parts of the empire differing greatly in climatic conditions.

| Stations. | Latitude. | | Longitude. | | Altitude. | Mean number of days with rain. |
|---|---|---|---|---|---|---|
| | ° | ′ | ° | ′ | *Meters.* | |
| Kumamoto | 32 | 48 | 130 | 42 | 17 | 156 |
| Matsuyama | 33 | 50 | 132 | 45 | 32 | 141 |
| Osaka | 34 | 52 | 135 | 31 | 6 | 113 |
| Hiroshima | 34 | 23 | 132 | 27 | 3 | 129 |
| Nagoya | 35 | 10 | 136 | 55 | 15 | 140 |
| Tokio | 35 | 41 | 139 | 45 | 21 | 142 |
| Hakodate | 41 | 46 | 140 | 44 | 3 | 178 |
| Sapporo | 43 | 4 | 141 | 21 | 17 | 188 |

[1] Journal of the Meteorological Society of Japan, November, 1904, p. 9.
[2] Zeitschrift Oesterreichischen Gesellschaft für Meteorologie, Band 15, 1880, p. 362. [3] Meteorologische Zeitschrift, 1884, vol. 1, p. 461.



TABLE 1.—*Mean monthly and annual duration of precipitation, in hours, for the period 1892–1901, computed by Köppen's formula from hourly, six-daily, and tridaily observations.*

| Months. | Hourly observations. | 6-daily observations. | 3-daily observations. | Difference. 6-daily minus hourly. | Difference. 3-daily minus hourly. |
|---|---|---|---|---|---|
| **KUMAMOTO.** | | | | | |
| January | 82.9 | 75.1 | 87.8 | − 7.8 | + 4.9 |
| February | 87.3 | 88.7 | 92.7 | + 1.4 | + 5.4 |
| March | 125.0 | 126.5 | 125.7 | + 1.5 | + 0.7 |
| April | 130.3 | 122.4 | 136.8 | − 7.9 | + 6.5 |
| May | 121.5 | 122.8 | 119.0 | + 1.3 | − 2.5 |
| June | 127.3 | 126.0 | 126.7 | − 1.3 | − 0.6 |
| July | 102.3 | 107.9 | 117.6 | + 5.6 | +15.3 |
| August | 49.1 | 46.9 | 49.8 | − 2.2 | + 0.7 |
| September | 94.0 | 87.8 | 83.6 | − 6.2 | − 5.4 |
| October | 78.8 | 81.1 | 77.4 | + 2.3 | − 1.4 |
| November | 59.4 | 61.9 | 61.9 | + 2.5 | + 2.5 |
| December | 64.1 | 62.5 | 67.0 | − 1.6 | + 2.9 |
| Year | 1122.0 | 1110.6 | 1151.0 | −11.4 | +29.0 |
| **OSAKA.** | | | | | |
| January | 63.3 | 62.5 | 59.5 | +10.3 | + 7.3 |
| February | 58.8 | 63.6 | 62.9 | + 4.8 | + 4.1 |
| March | 100.2 | 101.2 | 98.2 | + 1.0 | − 2.0 |
| April | 116.1 | 115.9 | 115.2 | +20.7 | +20.2 |
| May | 102.0 | 100.5 | 100.4 | − 1.6 | − 1.6 |
| June | 112.6 | 110.2 | 108.0 | − 2.4 | − 4.6 |
| July | 85.5 | 90.8 | 84.8 | + 5.3 | − 0.7 |
| August | 38.8 | 37.2 | 36.5 | − 1.6 | − 2.3 |
| September | 110.1 | 109.4 | 92.9 | − 0.7 | −17.2 |
| October | 92.8 | 95.2 | 96.0 | + 2.4 | + 3.2 |
| November | 66.3 | 66.2 | 44.6 | − 0.1 | −21.7 |
| December | 47.0 | 46.8 | 46.1 | − 0.2 | − 0.9 |
| Year | 961.5 | 999.4 | 945.1 | + 3.7 | −16.4 |
| **TOKIO.** | | | | | |
| January | 69.6 | 69.9 | 75.9 | + 0.3 | + 6.3 |
| February | 68.4 | 69.0 | 67.7 | + 0.6 | − 0.7 |
| March | 127.3 | 124.2 | 124.2 | − 3.1 | − 3.1 |
| April | 137.7 | 137.5 | 141.1 | + 0.2 | + 3.4 |
| May | 131.1 | 128.0 | 130.9 | − 3.1 | − 0.2 |
| June | 135.2 | 138.2 | 138.2 | + 3.0 | + 3.0 |
| July | 114.8 | 116.1 | 110.8 | + 1.3 | − 4.0 |
| August | 66.0 | 66.2 | 73.7 | + 0.2 | + 7.7 |
| September | 151.4 | 154.1 | 156.8 | + 2.7 | + 5.6 |
| October | 133.0 | 134.7 | 137.6 | + 1.7 | + 4.6 |
| November | 78.0 | 78.5 | 81.4 | + 0.5 | + 3.4 |
| December | 47.2 | 46.9 | 41.7 | − 0.3 | − 5.5 |
| Year | 1259.5 | 1263.3 | 1280.2 | + 3.8 | +20.7 |
| **SAPPORO.** | | | | | |
| January | 226.3 | 225.4 | 232.9 | − 0.9 | + 6.6 |
| February | 188.7 | 183.4 | 184.8 | − 5.3 | − 3.9 |
| March | 200.4 | 202.4 | 215.8 | + 2.0 | +15.4 |
| April | 106.1 | 108.7 | 105.8 | + 2.6 | − 0.3 |
| May | 111.8 | 112.3 | 116.1 | + 0.5 | + 4.3 |
| June | 101.1 | 98.6 | 97.9 | − 2.5 | − 3.2 |
| July | 101.2 | 99.7 | 103.4 | − 1.5 | + 2.2 |
| August | 101.4 | 101.1 | 110.1 | − 0.3 | + 8.7 |
| September | 118.7 | 116.6 | 121.7 | − 3.1 | + 2.0 |
| October | 116.4 | 113.8 | 118.3 | − 2.6 | + 1.9 |
| November | 159.7 | 157.7 | 165.6 | − 2.0 | + 5.9 |
| December | 212.6 | 209.0 | 223.2 | − 3.6 | +10.6 |
| Year | 1745.4 | 1728.7 | 1795.6 | −16.7 | +50.2 |

The results for these eight stations, four of which are given in Table 1, show that the durations computed from tridaily and from hourly observations do not differ by more than 4 per cent in the annual means or 18 per cent in the monthly means, while a comparison of the hourly with the six-daily observations shows a still closer agreement. Comparing these figures with the results obtained from his self-recording rain gage, and assuming that the differences in the latter case are due chiefly to instrumental errors, Mr. Okada concludes that the duration of precipitation may be computed from tridaily observations more accurately than it is recorded by the gage. His comparison, however, is inexact, since it is based in one case upon 10-year means and in the other case upon either 4-year means or individual months and years. This method of computation may give approximate mean values, but probably within larger

TABLE 2.—*Differences, in hours, of the mean durations of precipitation, for the period 1892-1901, as computed by Köppen's formula from hourly, six-daily and tridaily observations.*

| Stations. | Mean of the monthly differences. | | Greatest difference. | | Least difference. | |
|---|---|---|---|---|---|---|
| | 6-daily minus hourly. | 3-daily minus hourly. | 6-daily minus hourly. | 3-daily minus hourly. | 6-daily minus hourly. | 3-daily minus hourly |
| Kumamoto | 3.5 | 6.5 | − 7.9 | −15.3 | ± 1.3 | − 0.6 |
| Osaka | 4.3 | 7.2 | +20.7 | −21.7 | − 0.1 | − 0.7 |
| Tokio | 1.4 | 4.0 | − 3.1 | + 7.7 | + 0.2 | − 0.2 |
| Sapporo | 2.3 | 5.4 | − 5.3 | +15.4 | − 0.3 | − 0.3 |

limits of error than those given above. An examination of the columns of differences in Table 1[4] will show that abnormally large and abnormally small differences often occur in the same month.

The self-registering rain gages in use by the Weather Bureau, although they may not show the true time of beginning and ending of precipitation, give with considerable accuracy the duration between the first and last recorded hundredths of an inch, and this information is for most purposes of more value than a record of total duration that does not distinguish the period of inappreciable precipitation.—*F. O. S.*

## A RECORD BROKEN AT THOMPSON HILL, CONN.

Miss Ellen D. Larned, at Thompson Hill, Windham County, Conn., keeps a record of the weather extending back over the unusual period of fifty-three years. In a recent letter she writes that the year 1904 has lowered her previous minimum by nearly one degree.

| | ° |
|---|---|
| Previous lowest mean annual temperature, (1888) | 44.8 |
| Mean annual temperature for 1904 | 43.9 |
| Mean annual temperature, 1852-1901 | 46.0 |
| Warmest year, 1878 | 49.1 |
| Coldest year, 1904 | 43.9 |

Miss Larned also notes that with the exception of May, 1904, each month since May, 1903, has been below the normal, a sequence without parallel in either her own record or any other that she has been able to examine. As the deficit was very small in some of the months it may not have occurred at other stations.—*F. O. S.*

# THE WEATHER OF THE MONTH.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

## PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and VI.

The mean pressure for the month was unusually high over the northern and middle Plateau, the slope, Missouri and Missisppi valleys, and Gulf districts, with the crest 30.40 to 30.43 inches overlying northern and central South Dakota, North Dakota, and northeastern Montana.

The lowest mean pressure reported was 30.01 inches at Eastport, Me.

The pressure was everywhere above the normal for the month, except over the extreme southwestern portion and the northern portion of California, southwestern Oregon, and western Nevada. The greatest negative departure was —.04 inch at Eureka, while departures ranging from +.20 to +.30 inch were reported from stations in the Missouri Valley, Oklahoma, the middle and northern slope regions, and North Dakota, the greatest departures occurring in the Dakotas.

The mean pressure increased over that of December in all districts, except in southern Oregon, western Nevada, and the northern and central portions of California.

Over the region from Montana, North Dakota, and Minnesota, southeastward and southward to the Gulf coast of eastern Texas, Louisiana, Mississippi, and western Florida, the departures were very marked, and ranged from +.35 inch at stations in eastern Montana, and North Dakota to from +.11 to +.13 inch on the Gulf coast. The greatest decreases in pressure ranged from —.05 to —.08 inch over western Nevada and northern and central California.

## TEMPERATURE OF THE AIR.

The mean temperature for the month was above the normal in the Pacific and Plateau districts, the northern slope, and western portions of the middle and southern slope regions, and the Valley of the Red River of the North. In the remaining districts the mean temperature was below the normal.

Over the greater portion of the Pacific and Plateau regions the departures from the normal ranged from +2.0° to +7.4°, the maximum departures occurring over northeastern Washington, Idaho, and northern Nevada.

From the slope regions eastward to the Atlantic Ocean the departures were very marked and ranged from —2.0° to —8.7°, the greatest departures, more than —6.0°, being reported from the central and lower Ohio Valley, Tennessee, the central and northern portions of the east Gulf States, eastern Arkansas, Oklahoma, southeastern Kansas, southern and central Missouri, and southern Illinois. The maximum departure occurred in east-central Kentucky.

Maximum temperatures ranging from somewhat below freezing to 91° occurred during the month. Maximum temperatures of 80°, or higher, were reported from central and southern Florida, the lower Rio Grande Valley, southwestern Arizona, and extreme southeastern California.

Zero temperatures occurred as far south as extreme northern Virginia, southern Tennessee, central Arkansas, southern Indian Territory, southern border of Oklahoma, northwestern Texas, northeastern New Mexico, southern boundary of Utah, and central Nevada. Minimum temperatures of 30°, or more, below zero were reported from portions of Wisconsin, Minnesota, the Dakotas, northeastern Montana, the interior of Maine, and northeastern New Hampshire.

The average temperatures for the several geographic districts and the departures from the normal values are shown in the following table:

*Average temperatures and departures from normal.*

| Districts. | Number of stations. | Average temperatures for the current month. | Departures for the current month. | Accumulated departures since January 1. | Average departures since January 1. |
|---|---|---|---|---|---|
| | | ° | ° | ° | ° |
| New England | 8 | 21.3 | − 3.2 | | |
| Middle Atlantic | 12 | 28.5 | − 3.4 | | |
| South Atlantic | 10 | 41.6 | − 4.3 | | |
| Florida Peninsula * | 8 | 55.4 | − 4.2 | | |
| East Gulf | 9 | 42.8 | − 5.6 | | |
| West Gulf | 7 | 48.3 | − 2.9 | | |
| Ohio Valley and Tennessee | 11 | 27.4 | − 6.5 | | |
| Lower Lake | 8 | 21.0 | − 4.3 | | |
| Upper Lake | 10 | 14.1 | − 3.4 | | |
| North Dakota * | 8 | 0.7 | − 4.9 | | |
| Upper Mississippi Valley | 11 | 16.0 | − 5.1 | | |
| Missouri Valley | 11 | 15.1 | − 5.2 | | |
| Northern Slope | 7 | 18.2 | + 0.7 | | |
| Middle Slope | 6 | 24.7 | − 4.3 | | |
| Southern Slope * | 6 | 34.3 | − 4.5 | | |
| Southern Plateau * | 13 | 40.8 | + 3.1 | | |
| Middle Plateau * | 8 | 28.5 | + 3.6 | | |
| Northern Plateau * | 12 | 29.1 | + 3.7 | | |
| North Pacific | 7 | 41.3 | + 2.0 | | |
| Middle Pacific | 5 | 49.4 | + 2.8 | | |
| South Pacific | 4 | 55.2 | + 4.6 | | |

* Regular Weather Bureau and selected voluntary stations.

[4] The reader may observe one or two discrepancies in this table. These are doubtless due to misprints in the original.